

NEW DISTRIBUTION RECORDS FOR NORTH CAROLINA MACROINVERTEBRATES¹

David R. Lenat, David L. Penrose²

ABSTRACT: Collections made by the North Carolina Department of Natural Resources were used to establish 30 new distribution records for the state's Ephemeroptera, Plecoptera and Trichoptera. Also, recently published North Carolina distribution records are summarized for an additional 15 species.

The benthic macroinvertebrate fauna of North Carolina had been poorly documented prior to 1982. Some publications were available dealing with specific groups (e.g. Traver 1932), but even these few studies were often out-of-date and/or incomplete. For these reasons, the publication of *Aquatic Insects and Oligochaetes of North and South Carolina* (Brigham et al. 1982) was a landmark event. This book presented both faunal lists and keys, with an emphasis on immature stages and aquatic adults. Note, however, that Brigham *et al.* (1982) rarely distinguished between North Carolina and South Carolina records. Validation of new North Carolina records requires an examination of earlier literature.

The North Carolina Division of Environmental Management annually collects benthic macroinvertebrates at about 300 sites. This process has resulted in a number of new distribution records. Data for three groups (Ephemeroptera, Plecoptera and Trichoptera) are presented here; distribution records for other groups will be published separately. This paper also summarizes other recently published North Carolina records with notes on abundance and distribution.

New North Carolina Records

Ephemeroptera

The taxonomy of immature Ephemeroptera is relatively well established. However, species level identifications are still difficult for many families, especially the Baetidae, and we expect that further taxonomic revisions will result in many new distribution records. Fifteen new distribution records are listed below; ten of these were listed by Brigham et al. (1982) as occurring, or probably occurring, in North and South Carolina. Unless otherwise specified, all identifications were based on nymphs.

Baetisca gibbera Berner. Distribution records for this species (Pescador and Berner 1981) include most of the southeastern United States from Virginia to Florida, but no North Carolina records had been listed.

¹Received December 16, 1985. Accepted January 8, 1987.

²NC Dept. Natural Resources, Archdale Bldg. P.O. Box 27687, Raleigh NC 27611

This species is widespread within the inner coastal plain region of North Carolina. Collection localities include: Trent River, Jones Co.; Black River, Sampson Co.; Moseley Creek, Lenoir Co. and Little River, Montgomery Co.

Baetisca obesa (Say). Distribution records available in Pescador and Berner (1981) indicate that this species is widespread throughout the eastern United States (Massachusetts to Florida), but this species had not been reported from North Carolina. Our data indicates that *B. obesa* is common in inner coastal plain rivers of North Carolina. Collection localities include Black River, Sampson Co.; Neuse River, Wayne Co. and Tar River, Pitt Co.

Baetisca laurentina McDunnough. Pescador and Berner (1981) indicate that this species is widespread throughout the central United States and Canada. The new North Carolina record is from Jacob Fork, Catawba Co.

Neophemera youngi Berner. This is a coastal plain and piedmont species, previously recorded from Florida to Virginia (Berner 1977, Kondratieff and Voshell 1983). It had not been reported from North Carolina, but our collections indicate a similar piedmont/coastal plain distribution: Black River, Sampson Co., Little River, Johnson Co.; Knob Creek, Cleveland Co.

Ephemerella argo Burks. There are unconfirmed records of this species in the Savannah River (GA/SC: Patrick et al. 1967), otherwise it is known only from a small area in Illinois and Indiana (Allen and Edmunds 1965). The very distinctly patterned nymph of *E. argo* was collected and identified by Trish Finn MacPherson (NC Dept. Natural Resources) from several locations on the Lumber River, Robeson Co. The identification was confirmed by M. Pescador.

Ephemerella needhami McDunnough. Allen and Edmunds (1965) indicate that *E. needhami* is a northern species, with Virginia as the southern limit of its distribution; Berner (1977) added single collection localities in Alabama and South Carolina. In North Carolina, we have collected this species only in one river basin: Little River, Wake/Johnston Co.; Buffalo Cr., Johnston Co.

Leptohyphes Eaton. This genus has been collected in the southeast only from Georgia and South Carolina (Berner 1977). In North Carolina, we have collected nymphs from several piedmont localities: Little River, Johnston Co.; Uwharrie River, Montgomery Co. and the Tar River, Franklin Co. Specimens from the Little River were verified by M. Pescador, but could not be definitely assigned to any known species.

Choroaterpes Eaton. *Choroaterpes* (2 species) has been recorded throughout most of the southeastern United States (Berner: FL, MS, LA, AL, GA, TN). We have collections in North Carolina from an unnamed tributary of Lanes Creek, Union Co., and the upper Waccamaw River, Columbus Co. Waccamaw River specimens were verified by M. Pescador.

Leptophlebia bradleyi Needham. *L. bradleyi* is a winter emerging species which has been collected from scattered localities throughout the southeast, with additional records in Texas and New York (Henry and

Kondratieff 1982). Adults of this species were collected and identified by D. Stephan (NC State University, personal communication) at Big Marsh Swamp (below McNeils Lake) in Bladen Co.

Homoeoneuria cahabensis Pescador and Peters. *H. cahabensis* was described by Pescador and Peters (1980) from Alabama and Mississippi. We have collected this species from a limited area of the North Carolina piedmont: Hunting Creek, Iredell Co.; South Fork Yadkin River, Davie Co. and South Fork Catawba River, Lincoln Co. Identification has been confirmed by M. Pescador.

Tortorpus incertus Traver. There are scattered records for this species throughout the southeastern United States (Berner 1977: FL, LA, MS, AL, GA, SC). We collected several nymphs from the Tar River in Franklin Co., and D. Stephan (NC State University, personal communication) has collected adults in Bladen Co., near the South River.

Baetis hageni. This is a "northern transcontinental species" with specimens collected as far south as Missouri (Moriyama and McCafferty 1979). In North Carolina, we have collected nymphs from an unnamed tributary of Fytes Creek, Mecklenburg Co.

Heterocloeon petersi Muller-Liebenau. This species, identified from our collections by M. Pescador, was found in the New River, Allegheny Co.

Paracleodes Day. This genus is unusual for its occurrence in highly perturbed warm-water rivers (Edmunds et al. 1976). In North Carolina, we have collections (possibly representing two species) from several piedmont and coastal plain sites: Neuse River, Wake/Wayne Co.; Tar River, Edgecombe Co.; Hunts Fork, Davidson Co. The Neuse River specimens were identified from our collections by P. Carlson.

Barbaetis benfieldi Kennedy. This new genus has recently been described from the New River in Virginia, near the North Carolina border (Waltz et al. 1985). We have several North Carolina collections, including the Cullasaja River, Macon Co.; East Fork French Broad River, Transylvania Co.; Cullowhee Creek, Jackson Co and the Tuckaseegee River, Jackson Co.

Plecoptera

Many Plecoptera are poorly known in the nymphal stage, particularly the Capniidae and Leuctridae. Further taxonomic work may yield many new distribution records in North Carolina. Many of the Plecoptera records listed below reflect recent taxonomic revisions of stonefly genera. New distribution records are listed below for eight species; three of these were listed by Brigham et al. (1982) as occurring, or probably occurring, in North and South Carolina. All identifications were based on nymphs.

Zapada chila (Ricker). We have collected this species in North Carolina only from the South Fork New River, Ashe Co.

Paragnetina kansensis Banks. Previous records (Stark and Szczytko 1981) indicate that this species occurs in portions of the southeastern United States (GA, SC). In North Carolina, we have collected *P. kansensis* from the Northeast Cape Fear River, Duplin Co., and the Lumber River, Robeson Co. Dark specimens of *P. fumosa* may be difficult to separate from *P. kansensis* (B. Kondratieff, personal communication), but in this case we would also expect to find some typical *P. fumosa* in the collections.

Diploperla morgani Kondratieff and Voshell. This species was previously collected only in Virginia and West Virginia (Kondratieff *et al.* 1981) Our North Carolina collections were limited to the North Fork of the Mitchell River, Surry Co.

Diploperla duplicata (Banks). This species has been collected in Georgia, South Carolina, Tennessee and West Virginia. Our collections in North Carolina include both piedmont and mountain localities: Big Alamance Creek, Guilford Co., Parkers Creek, Forsyth Co., Jacobs Fork, Burke Co., and West Fork French Broad River, Transylvania Co.

Helopicus bogaloosa Stark and Ray. This species was described by Stark and Ray (1983) from the southeastern United States (FL, GA, AL, MS) and has recently been recorded from South Carolina by Kondratieff and Painter (1986). We have collected *H. bogaloosa* from Naked Creek, Richmond Co. and the Lumber River, Hoke and Robeson Co. It may be found throughout the sandhills region.

Isoperla frisoni Illies. This is primarily a northern species (Hitchcock 1974), but we have North Carolina collections from the Hiawassee River, Cherokee Co. and the Dan River, Stokes Co.

Isoperla slossonae (Banks). This species is often locally common in the northeast, including Virginia (B. Kondratieff, personal communication). In North Carolina, we have collected *I. slossonae* only from localities in the New River basin: South Fork New River, Ashe Co. and Big Laurel Creek, Ashe Co.

Isoperla burksi Friscon. This species is found in North Carolina in the Cape Fear and Yadkin River drainages. Our collections include Fork Creek, Randolph Co. and Bear Creek, Chatham Co.

Trichoptera

The Trichoptera of the Carolina's area are relatively well known, largely due to the work of John Morse and his students. Seven new distribution records are listed below; Four of these were listed by Brigham *et al.* (1982) as occurring, or probably occurring, in North and South Carolina. All identifications are based on larvae.

Brachycentrus lateralis (Say). *B. lateralis* is primarily a northeastern

species, but the known distribution includes South Carolina and Tennessee (Flint 1984). We have a single collection from the Johns River, Catawba Co. Identification of *B. lateralis* was confirmed by O. Flint.

Brachycentrus incanus Hagen. *B. incanus* is another northeastern species, with the known distribution extending as far south as Virginia (Flint 1984). We have collected larvae which key to this species from the Tar River, Nash Co. Note, however, that Flint's (1984) association of the larvae and adult was considered tentative.

Brachycentrus chelatus Ross. This southeastern species has been collected from Florida, Alabama, Georgia and South Carolina (Flint 1984). We have collected *B. incanus* from two naturally acidic streams in the sandhills region: Naked Creek, Richmond Co. and Quewhiffle Creek, Hoke Co.

H. (C.) ventura Ross. This species may be near its southern limit in North Carolina, having been collected only in the New River basin: South Fork New River, Ashe Co. and New River, Alleghany Co. *H. ventura* larvae were identified from our collections by G. Schuster.

Leucotrichia pictipes (Banks). This pollution-tolerant species is widespread in the northern mountains and piedmont. Larvae of *Leucotrichia* may be missed by normal collection techniques due to their tightly adhering case. North Carolina localities include: Pigeon River, Haywood Co.; Dan River, Stokes Co.; Ararat River, Surry Co.; Catawba River, McDowell Co. and New River, Alleghany Co. Some specimens were verified by J. Morse.

Ceraclea mentiea (Walker). *C. mentiea* has been recorded from the north-central and northeastern United States (Morse 1975). We have collected this species only in the New River basin: New River, Alleghany Co., North and South Forks of the New River, Ashe Co. Identification was confirmed by J. Morse.

Nyctiophylax moestus Banks. Larvae of this species was described by Flint (1964) as *Nyctiophylax* sp. A (Morse 1972). Our collections indicate that it is widespread in the piedmont and southern coastal plain regions of North Carolina: Black River, Sampson Co.; South River, Bladen Co.; Lumber River, Robeson Co.; Island Creek, Jones Co.; McLendons Creek, Moore Co. and Barnes Creek, Montgomery Co.

Recently Published Distribution Records From North Carolina

The records listed below are primarily intended to update the faunal lists in Brigham et al. (1982). We include here the species name, the published record(s) and general comments on distribution:

Baetis pluto McDunnough. Lenat (1983). Common throughout the piedmont and mountain regions.

Baetis flavistriga McDunnough. Berner (1977), Lenat (1983). Common throughout North Carolina, especially in smaller streams, very pollution-tolerant.

Ephemerella bernerii Allen and Edmunds. Penrose et al. (1982). Common in clean mountain rivers with a single piedmont record (Eno River, Durham Co.).

Baetisca bernerii Tarter and Kirchner. Penrose et al. (1982). Found in clean streams and rivers within the New River and French Broad River basins.

Tallaperla elisa Stark, *T. anna* (Needham and Smith), *T. cornelia* (Needham and Smith). Stark (1983). These species are found in mountain streams, but are separable only as adults.

Isoperla namata Frison. Lenat (1983). Common throughout the piedmont region.

Paragnetina ichusa Stark and Szczytko. Stark and Szczytko (1981). Common in large streams and rivers of the mountain region.

Oconoperla innubila (Needham and Claassen). Stark (1985). Found in spring seeps in the mountain area.

Acroneuria evoluta Klapalek. Lenat (1983). Rare in streams and rivers of the Haw River drainage, Chatham, Orange and Alamance counties.

Helicopsyche borealis (Hagen). Penrose et al. (1982). This species is rare in North Carolina mountain rivers, matching the known distribution in other southeastern states. However, a disjunct population of *H. borealis* may also be found in some sandhills streams. The sandhills region is the only area in North Carolina where this species is abundant.

Brachycentrus appalachia Flint. Flint (1984). Common in the mountain region.

Hydropsyche morosa (Hagen). Penrose et al. (1982). Common in the mountain region.

Rhyacophila ledra Ross. Lenat (1983). Widespread in small piedmont streams.

Hydroptila coweetensis Huryn. Huryn (1985). Adults and pupae were collected from a high elevation rock outcrop in Coweeta National Forest, Macon Co.

ACKNOWLEDGMENTS

Invertebrate samples were collected by many individuals, including Ferne Winborne, Trish Finn MacPherson, Jimmie Overton, Dianne Moody, Karen Lynch and Steve Mitchell. Taxonomic assistance was received from John Morse, Paul Carlson, Boris Kondratieff, Manuel Pescador, Guenter Schuster, William McCafferty and Oliver Flint.

LITERATURE CITED

Allen, R.K. and G.F. Edmunds, Jr. 1965. A revision of the genus *Ephemerella* (Ephemeroptera: Ephemerellidae). VIII. The subgenus *Ephemerella* in North America.

- Misc. Publ. Entomol. Soc. Am. 4:243-282.
- Berner, L. 1977. Distributional patterns of southeastern mayflies (Ephemeroptera). Bull. Florida St. Mus. Biol. Sci. 22:1-56.
- Brigham, A.R., W.R. Brigham and A. Gnilka. 1982. Aquatic Insects and Oligochaetes of North and South Carolina. Midwest Aquatic Enterprises. Mahomet, Illinois, 837 pp.
- Edmunds, G.F., Jr., S.L. Jensen and L. Berner. 1976. The mayflies of North and Central America. Univ. Minn. Press, Minneapolis, 330 pp.
- Flint, O.S. 1964. Notes on some nearctic Psychomyiidae with special reference to their larvae (Trichoptera). Proc. U.S. Nat. Mus. 115: 467-481.
- Flint, O.S. 1984. The genus *Brachycentrus* in North America, with a proposed phylogeny of the genera of Brachycentridae (Trichoptera). Smith. Contr. Zool. 398: 1-58.
- Henry, B.C. and B.C. Kondratieff. 1982. New state records of the mayfly *Leptophlebia bradleyi* Needham (Ephemeroptera: Leptophlebiidae). Ent. News 93: 125-126.
- Hitchcock, S.W. 1974. Guide to the insects of Connecticut. Part VII. The Plecoptera or stoneflies of Connecticut. Bull. St. Geol. Nat. Hist. Survey Connecticut 107: 1-262.
- Hury, A.D. 1985. A new species of *Hydroptila* (Trichoptera: Hydroptilidae) from North Carolina. Proc. Entomol. Soc. Wash. 87: 444-447.
- Kondratieff, B.C., R.F. Kirchner and J.R. Voshell, Jr. 1981. Nymphs of *Diploperla*. Ann. Entomol. Soc. Am. 74: 428-430.
- Kondratieff, B.C. and W.B. Painter. 1986. Two new records of stoneflies (Plecoptera: Perlodidae) from South Carolina. Ent. News 97: 17-20.
- Kondratieff, B.C. and J.R. Voshell, Jr. 1983. A checklist of the mayflies of Virginia, with a review of pertinent taxonomic literature. J. Georgia Entomol. Soc. 18: 273-279.
- Lenat, D.R. 1983. Benthic macroinvertebrates of Cane Creek, North Carolina, and comparisons with other southeastern streams. Brimleyana 9: 53-68.
- Morihara, K.K. and W.P. McCafferty. 1979. The *Baetis* larvae of North America (Ephemeroptera: Baetidae). Trans. Am. Entomol. Soc. 105: 139-221.
- Morse, J.C. 1972. The genus *Nyctiophylax* in North America, J. Kansas Entomol. Soc. 45: 172-181.
- Morse, J.C. 1975. A phylogeny and revision of the caddisfly genus *Ceraclea* (Trichoptera, Leptoceridae). Contr. Am. Entomol. Inst. 11: 1-97.
- Parker, C.R. and J.R. Voshell, Jr. 1981. A preliminary checklist of the caddisflies (Trichoptera) of Virginia. J. Georgia Entomol. Soc. 16: 1-7.
- Patrick, R., J. Cairns and S.S. Roback. 1967. An ecosystematic study of the fauna and flora of the Savannah River. Proc. Acad. Nat. Sci. Phila. 118: 109-407.
- Penrose, D.L., D.R. Lenat and K.W. Eagleson. 1982. Aquatic invertebrates of the upper French Broad River basin. Brimleyana 8: 27-50.
- Pescador, M.L. and L. Berner. 1981. The mayfly family Baetiscidae (Ephemeroptera). Part II. Biosystematics of the genus *Baetisca*. Trans. Am. Entomol. Soc. 107: 163-228.
- Pescador, M.L. and W.L. Peters. 1980. A revision of the genus *Homoeoneuris* (Ephemeroptera: Oligoneuriidae). Trans. Am. Entomol. Soc. 106: 357-393.
- Schuster, G.A. and D.A. Etnier. 1978. A manual for the identification of the larvae of the caddisfly genera *Hydropsyche* Pictet and *Symphitopsyche* Ulmer in eastern and central North America (Trichoptera: Hydropsychidae). EPA-600/4-78-060, 129 pp.
- Stark, B.P. 1983. The *Tallaperla maria* complex of eastern North America (Plecoptera: Peltoperlidae). J. Kansas Entomol. Soc. 56: 398-410.
- Stark, B.P. 1985. Notes on *Oconoperla* (Plecoptera: Perlodidae). Ent. News 96: 151-155.
- Stark, B.P. and D.H. Ray. 1983. A revision of the genus *Helopicus* (Plecoptera: Perlodidae). Freshwat. Invertebr. Biol. 2: 16-27.
- Stark, B.P. and S.W. Szczytko. 1981. Contributions to the systematics of *Paragnetina* (Plecoptera: Perlidae). J. Kansas Entomol. Soc. 54: 625-648.
- Traver, J.R. 1932. Mayflies of North Carolina. J. Elisha Mitchell Sci. Soc. 47: 85-161, 48: 163-236.
- Waltz, R.D., W.P. McCafferty and J.H. Kennedy. 1985. *Barbaetis*: a new genus of eastern nearctic mayflies (Ephemeroptera: Baetidae). Great Lakes Ent. 18: 161-165.